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HD **OPEN THE DAM DOOR**
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The fur trade nearly wiped out beavers in North America. Now, we need them more than ever, Leila Philip writes

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Another United Nations climate summit has come and gone, with its typical mix of hope and gloom. Countries came to the historic decision to create a loss and damage fund that would compensate countries vulnerable to the climate crisis. But the reason for such a significant initiative is a dire one: A new scientific report has warned that we have just nine years to cut enough emissions to avert catastrophic warming.

So it's a good thing that North Americans have millions of highly skilled and industrious environmental engineers ready to enact a local and continental climate action and resiliency strategy. We just need to welcome them back.

This, of course, is the nature of *Castor canadensis*, the North American beaver: They create damming complexes that store, slow and cleanse water, ensuring that when rain falls, it moves gradually through the watershed, sinking down through the soils to recharge aquifers as it moves through the river system. By doing what they naturally do, beavers help ensure that our waterways function as they should: pulsing like vast arteries to bring water and life throughout the land.

But where an estimated 400 million beavers once lived throughout North America, from the end of the last great ice age up through the Holocene, only six million to 12 million exist today. That's because of the transatlantic fur trade, which was foundational to the early economies of Canada and the United States, but which also nearly wiped out beaver populations.

The fur trade began a process of what geomorphologists now refer to as the "great drying" – the roughly 300 years from 1600 to 1900 when we lost an estimated 80 per cent of our wetlands. Without wetlands, which serve as a system of great underground sponges to absorb and slow water as it moves through the land, we can end up with catastrophic floods that result in loss of life and cost billions in damage. By soaking up excess water during times of flood, then storing it as a vital underground water reserve, wetlands also help keep streams running, even through periods of severe heat and drought, which often lead to mega wildfires.

But as I would discover in the process of researching my forthcoming book, *Beaverland: How One Weird Rodent Made America*, when rivers and streams do have healthy populations of beavers living in them, those beavers build dams, canals and ponds that make river systems naturally resilient. According to one significant 2008 study by University of Alberta wildlife biologist Glynnis Hood, in times of drought between 1948 and 2002, beavers had increased the amount of open water in eastcentral Alberta by ninefold. It may seem counterintuitive, but by storing water, beaver damming complexes actually help to mitigate flooding, too.

The presence of beavers in a water system also increases water quality, as well as biodiversity. Studies have shown that active beaver ponds are home to one-third more species across the food chain than wetlands without beavers, meaning they are critical to preserving not just the quality and quantity of water where they live, but the entire ecosystem.

Their dams create supportive habitat for many endangered species, including salmon; the fish find refuge near the dams when they are young and eat the abundant insects that are drawn to the plant material caught up in the structures.

Over the past five years in the United States, there has been a growing movement toward a process called low-tech process-based restoration (LTPBR), which utilizes the work of beavers to reconnect stream systems to their floodplains. In LTPBR programs, beavers are relocated to river systems identified as being in need of restoration. If beavers are still present, they are supported with plantings of willow and aspen that they use for building and for food. Additionally, LTPBR programs create or supplement habitat with the construction of beaver dam analogues that slow rivers and spread water. If no beavers are yet living there, the hope is that they will be drawn back by the available habitat and food.

And by letting beavers do all of what they do for free, we can save a lot of money. In a 2020 study, researchers at the University of Wisconsin using sophisticated modelling found that the Milwaukee watershed could support an estimated 4,563 beavers. In 25 years, they forecast that this many new beavers lowering peak watershed flows could reduce the costs of flood damage to infrastructure by as much as 20 per cent, and provide the city with 1.7 trillion gallons of stormwater storage – a value of almost US\$3.3-billion.

Similar studies are under way to look at how beavers can improve wildfire resiliency. In California, a pilot study funded by the U.S. Fish and Wildlife Service looks at the concrete ways that beaver damming complexes play a role in wildfire mitigation.

That work has already documented dramatic ways in which beavers can both lessen fire damage and aid recovery. "There has been so much talk about the potential for beavers in riverscape restoration to help in the context of fire, but so little about where beavers could really be impactful," explained Emily Fairfax, an ecohydrologist at California State University Channel Islands who is leading the study with Joe Wheaton of Utah State University. "My goal is to make this an actionable climatechange solution."

To do so, the study hopes to identify how much beaver activity is needed in a particular area to change fire behaviour. "For some time, we've known that beavers can stop a fire going in a particular direction – usually small fires, not these mega fires," Dr. Fairfax said. "But even that is important to know when you are fighting a fire because it means these beaver wetlands can serve as speed bumps to a wildfire." While it isn't possible for beavers to be in every stream, relocating them to key areas such as alpine meadows, where even a few of the creatures can flood an entire area, could make a difference.

Having beavers in the landscape is not without challenges. Beavers are not going to be trained and do our bidding; they are going to do what beavers do best, which is cut down trees, build dams and create wetlands. When they do so, they can potentially flood roads and other infrastructure. But there are increasingly sophisticated methods of managing beaver activity, including the installation of pond levellers and flow devices that protect roads and culverts and prevent beaver ponds from overspilling.

The restoration of beavers in the United States, thanks to smart wildlife reintroduction programs in the early 1900s that brought them back to the landscape, is one of the greatest conservation success stories of the 20th century. The next step is updated education and beaver management policies.

Where I live, in Connecticut, it is illegal to relocate beavers, a vestige of a time when we believed that beavers posed a significant risk of disease transmission; they do not, and this law should be changed. We should also consider other bold ideas: Why not a conservation easement to pay farmers to set aside areas of land along creeks and streams, so that beavers can move in and help restore the watershed by creating

wetlands? We already subsidize farmers to plant certain crops (or not to) – so why not subsidize the significant ecosystem services that beavers provide?

It's ironic that centuries after we nearly wiped them out, beavers could have a vital role to play as we face our urgent task of developing strategies of climate resiliency. Let's just hope they don't hold a grudge.

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